

Solar Based DC Power Supplies for Rural Area

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Abstract: Imagine the electrical and electronic experiments to be done in the area where there is no electricity. A good electronics lab is to be set in remote area where there is frequent shut down of electricity or a sensor with appropriate signal conditioning circuit is to be set at a place where there is no electricity etc. Our aim is, why not to operate the instruments and devices in the laboratory by direct DC from solar panel. We experimented and found that it is possible, the answer is solar based power supplies.

Introduction: The core concept is, if you have a solar panels producing DC power, why are we converting it to AC and then back to DC to run the DC based electronics. Should one not be wiring up a DC circuit to power all DC electronics. Most of the electrical and electronic devices in physics laboratory operate on DC regulated power supply, a source which supplies constant voltage irrespective of the load value. In a solar photovoltaic system, almost 25% of its output is lost at the inverter; that converts the DC power generated by the PV panels to the AC power. Though AC to DC converters are about 98% efficient, it is the voltage conversion and regulation that causes most of the losses in power adapters; that is converting AC to DC involves loss of energy in one form or other. Even with best possible improvements in power supplies, a conversion efficiency of not better than 80% percent is achieved. Moreover, lot of energy is used to cool those hot-running components in the circuits, an additional loss of energy. We have not only designed three types of power supplies using solar panels but also used them in various DC based electronic circuits:

- A Solar Panel with Open Circuit output voltage of almost 18 volts is set for 12 volts using LM 317/ LM 7812 IC for Transistorized Circuits.
- A Solar Panel with Open Circuit output voltage of almost 8 volts is set for 5 volts using LM 317/ LM 7805 IC for TTL & Digital Circuits.
- Two Solar Panels with Open Circuit output voltage of almost 8 volts are appropriately connected to form a dual supply of ± 6 Volts using (LM 7808 & LM 7908) for Op-Amp Circuits.
- A standalone Solar based DC unit for 15W fan, 10 W LED lamp and two USB terminals for mobile charging, all on 40 Watt Panels & 35 AH battery.

Using these DC power supplies, electronic experiments can be performed even in remote areas where there is either no electricity or regular load shedding. To optimize the use of free solar energy available, few more applications which will be worth revenue generating & can supplement the need of college labs. Example, ice maker, distillation machine, desalination machine etc.

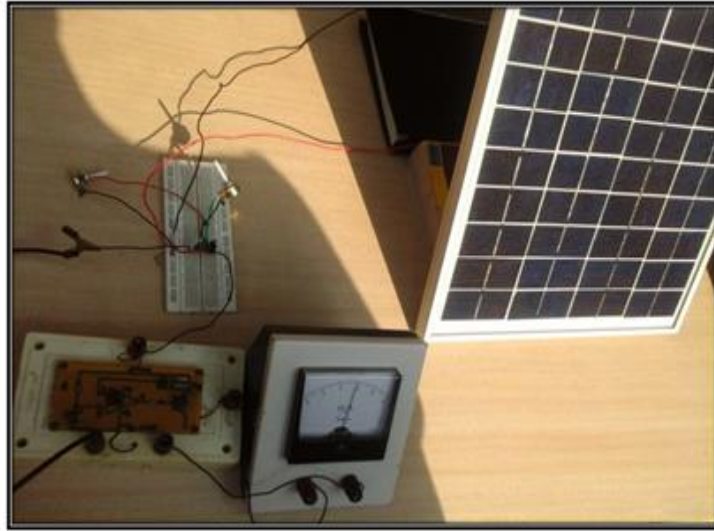
Keywords-Solar panel; battery, charge controller, voltage regulator; DC power supply

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3-Types of solar based regulated Power Supplies

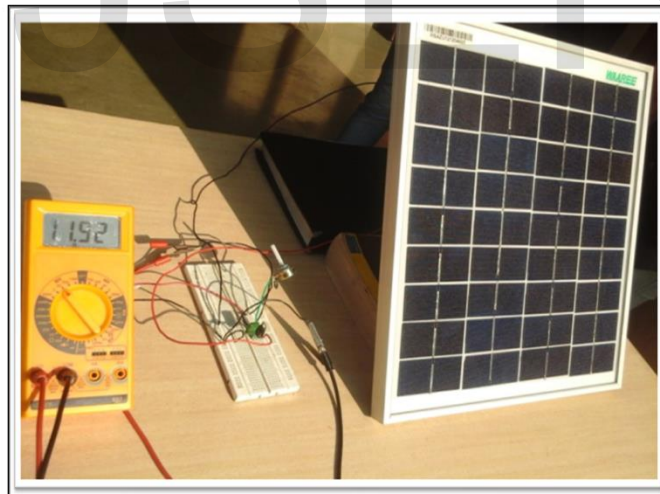


Solar Based Electronics Lab for Rural Areas



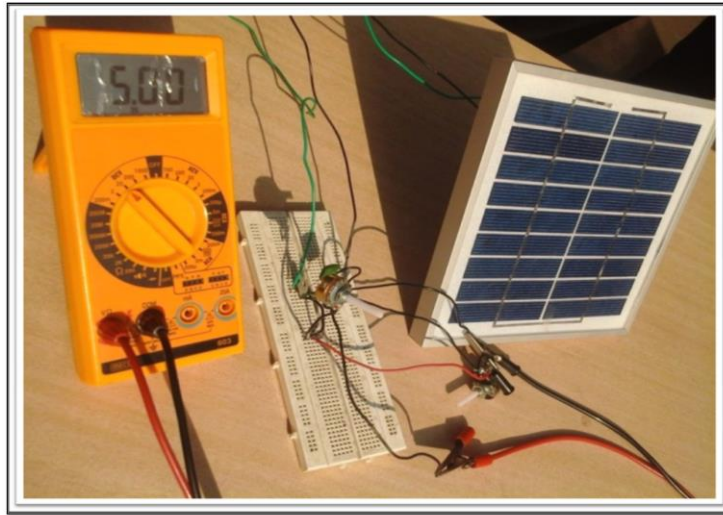
CURRENT REGULATOR

Solar Based Electronics Lab for Rural Areas



12V SRPS
FOR
TRANSISTORIZED CIRCUITS

Solar Based Electronics Lab for Rural Areas



5V SRPS
FOR
DIGITAL CIRCUITS

Solar Based Electronics Lab for Rural Areas

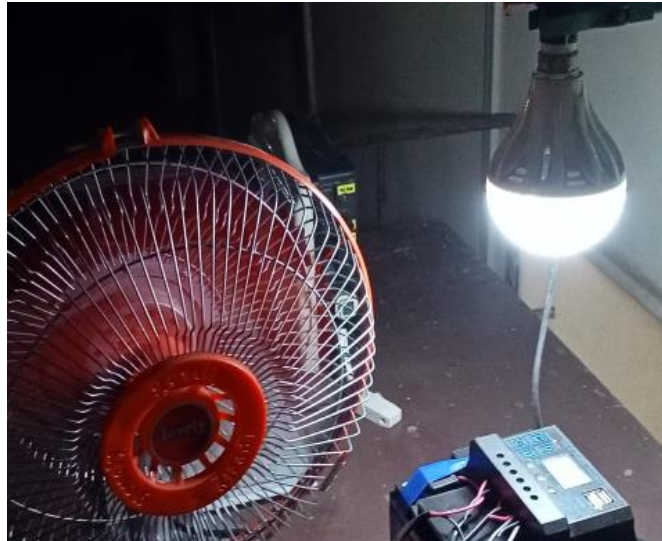
DUAL SUPPLY



- 6 V SRPS



+ 6 V SRPS



A standalone DC solar based unit on 40 Watt Panels & 35 AH battery.

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